PUBLIC TOLERANCE OF A SUBURBAN DEER HERD: IMPLICATIONS FOR CONTROL

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ABSTRACT

Suburban deer populations have been increasing in the eastern U.S., resulting in deer-human conflicts that can not always be resolved by a traditional management approach. Professionals responsible for management of deer damage (herd control and extension education) need information on the extent and nature of deer damage in suburban situations. Attitudes of suburban residential property owners about wildlife in general and deer in particular must be identified so that control measures that are socially acceptable as well as biologically feasible can be formulated. People's tolerance of deer damage and their propensity for undertaking on-site preventive measures need to be analyzed. Residents of Islip (Long Island), New York who live in the vicinity of the Seatuck National Wildlife Refuge were surveyed in spring 1985 to determine their experiences with Refuge deer. Damage to ornamental plants totalled $28,000 for the preceding year, but people generally enjoyed having deer in their neighborhood, and tolerated considerable damage. They were more concerned with the potential for transmission of Lyme disease by deer. Residents were generally in agreement with the concept of managing wildlife as a renewable resource, but they generally opposed sport or meat hunting, which might present a potential barrier to herd control. Most residents did not want a herd reduction, but this situation could change if the deer population were to increase substantially or if deer are found to be a key link in transmission of Lyme disease to humans. Implications of these findings are discussed relative to deer herd control and extension education, which might serve as complementary components of a program directed at alleviating deer damage.

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INTRODUCTION

The growth and geographic expansion of white-tailed deer (Odocoileus virginianus) in suburban areas in the eastern U.S. is a relatively recent phenomenon, but one that is becoming common (Flyger et al. 1983). The coexistence of suburban deer with humans results in potential economic losses due to deer damage to ornamental plants and vegetable gardens. The existence of urban "greenbelts" (e.g., bird sanctuaries, county parks, wooded stream corridors) accentuate the problem by allowing deer to "penetrate" surburbia more easily. These areas provide refuge where deer may spend most of their time, but from which they can move easily to nearby residential properties to obtain additional food.

This situation presents a difficult management problem for state agencies that have responsibility for managing wildlife. The conventional solution (i.e., recreational hunting) for reducing a deer population to an optimum level in rural settings is typically unworkable in suburban settings. Hunting often represents a safety hazard, but even in locations where such a control can be used safely, hunting is not acceptable generally to suburban residents (Flyger et al. 1983). Furthermore, extension education of affected publics about methods for alleviating damage can not assume that proven communication strategies developed in

the rural environment are applicable in this new situation (San Julian 1983). We need to conduct careful situation analyses to ensure that our intervention efforts (i.e., herd control, damage control, and educational communications about these subjects) consider the attitudes and values of the affected publics (O'Donnell and VanDruff 1983). Assumptions about these efforts that seem true in rural areas may not be true in suburbia.

The purpose of this paper is to describe the extent and nature of deer damage associated with an insular deer herd in suburbia, and to place public concerns about damage in perspective relative to other deer-related concerns. We attempt to present the implications of these results in a form useful to extension personnel with responsibility for education of publics about management of deer damage.

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STUDY AREA

The study was conducted in a residential area adjacent to the Seatuck National Wildlife Refuge (NWR), Islip (Long Island), New York. The Refuge consists of 200 acres of mowed lawns and ornamental plantings in the vicinity of 4 buildings on the site, woodlands, open fields, and salt marsh. Seatuck NWR is bounded by Champlin Creek and the Great South Bay on the east and south, respectively, and by the Scully Audubon Sanctuary on the west (Fig. 1). It is through the north end of the Refuge that deer move onto private residential property almost daily during fall-winter; a few deer have moved east by swimming Champlin Creek.

Movements and activity patterns of the Refuge herd of about 30 deer have been studied using radio-telemetry since March 1984. This information was used to delineate zones of deer-human contact of varying intensity adjacent to the Refuge, making the Islip area nearly ideal for this study. An additional feature of this site for the conduct of our research was the insular nature of the deer herd, so that deer-human interactions in the neighborhood and locally-derived perceptions about deer could be attributed primarily to the existence of this herd.

METHODS

Names and mailing addresses of all residential property owners in the study area were obtained using property-tax records. Each of the 605 people that was selected represented an Islip household near Seatuck NWR.

A self-administered, mail-back, booklet-format questionnaire was developed, similar to that used in studies of farmers' tolerance to deer damage (Brown et al. 1979, Brown and Decker 1979, Decker et al. 1981a), and landowners' tolerance of black bear damage (Decker et al. 1981b, 1985). Measures of characteristics of property owners and their properties that were pertinent to their proximity to the Seatuck deer herd were included in the questionnaire. The questionnaire contained questions about property owners' experiences with and perceptions of deer, including deer damage; estimates of the amount of damage (in dollars) incurred; specification of the plant types damaged; property owners' primary deer-related concerns, including pertinent non-damage items; and attitudes of property owners about wildlife in

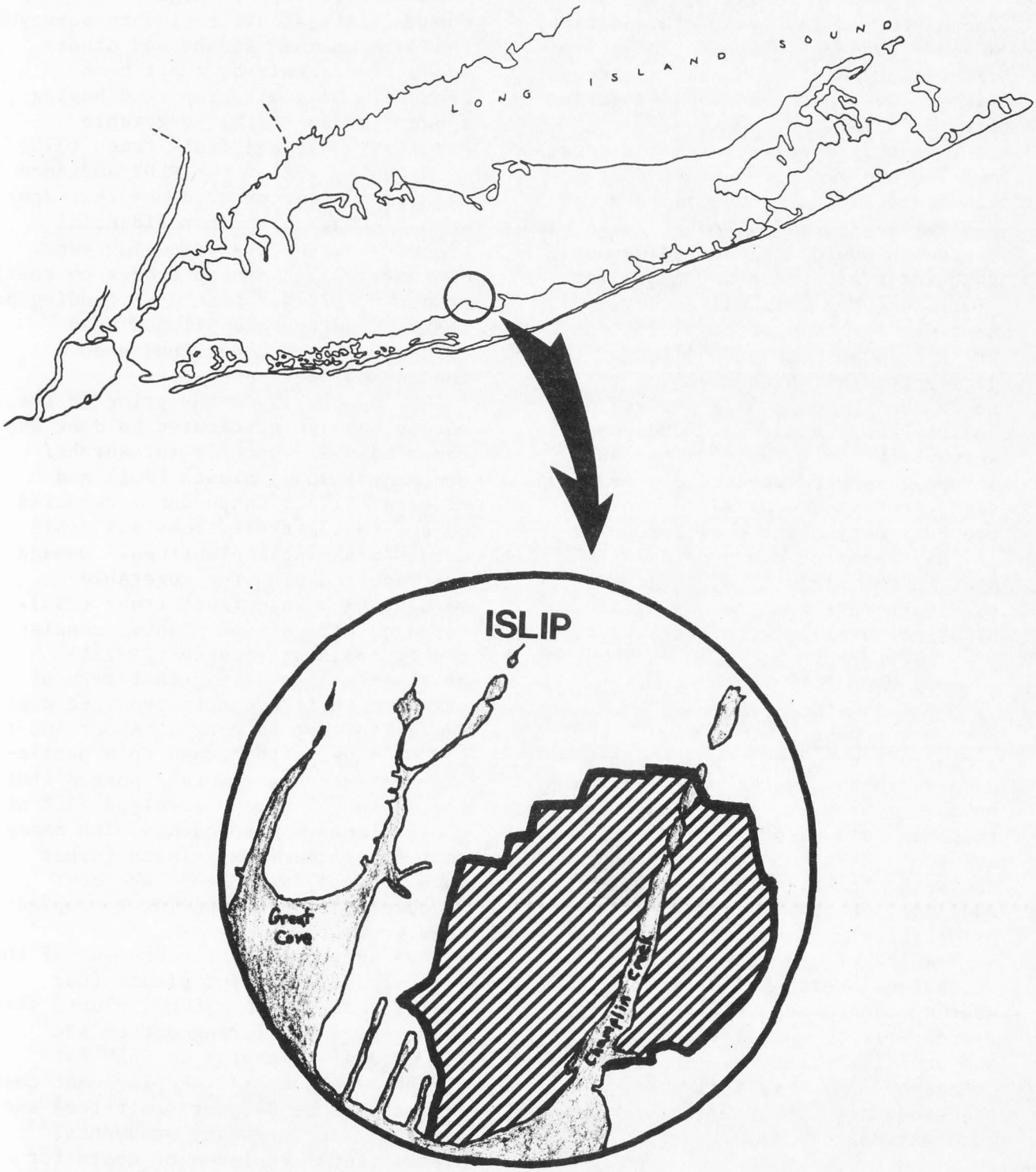

Figure 1. Study Area (shaded)--Seatuck National Wildlife Refuge and Adjacent Residental Area, Islip (Long Island), New York.

general and deer in particular.

The mail survey was implemented in early spring 1985. A procedure using up to 3 follow-up mailings to nonrespondents was employed. In addition, a nonrespondent telephone interview was conducted with 38 nonrespondents within the zone of known deer activity.

The study area included residences outside the zone of current deer movements so that a future resurvey following a period of anticipated herd expansion would include residences that incurred damage for the first time since the original survey. However, for this paper we concentrate on a segment of the larger survey population that we refer to as the "perceptually-derived deer impact (PDDI) audience." Respondents were placed into the PDDI audience if they reported seeing deer or deer sign (including damage) on their property during the previous year or if they reported ever seeing a deer in the vicinity of their property. Data were analyzed using the SPSSX computer program package.

RESULTS AND DISCUSSION

Survey Response

The survey of 605 households had 13 undeliverable questionnaires and 406 useable responses, for an adjusted response rate of 68.5% of deliverable questionnaires. Of the respondents, 300 were classified as the PDDI audience, which will serve as the primary focus of our analysis.

Results of the nonrespondent telephone interview indicated that nonrespondents were similar to respondents for all key attitudinal and profile variables. Thus, no nonresponse bias is indicated, and no adjustments to the mail survey data were warranted.

Extent of Deer Damage on PDDI Properties

A respondent's potential to incur deer damage is an important characteristic to identify. In the suburban residential environment of Islip, landscape plantings and vegetable gardens were likely targets for deer damage. Almost all residents surveyed (95%) maintained shrubs and other woody ornamentals on their home grounds. Many also reported having flower gardens (71%), vegetable gardens (40%), and fruit trees (37%).

Overall, 49% of the PDDI audience either saw deer or evidence that deer were feeding on their residential property during the preceding year. Of these, 72% had seen a deer on their property, 57% had seen deer feeding on their property, and 51% had seen evidence of where deer had been feeding on their property.

During the 12 months prior to the survey, damage attributed to deer was reported most commonly for shrubs/ornamental woody plants (76%) and flowers (51%). Respondents reported damage to 132 fruit trees and 3,512 shrubs/ornamental plantings. Damage was reported also for vegetable gardens (30%) and fruit trees (25%). For each category of plants, consistently about one-fourth (24-28%) of those people having that type of plant on their property reported deer damage in that category. About 40% to 60% of those with damage to a particular category of plants reported that the extent of damage involved $\geq$50% of their plants. Respondents with damage to shrubs/ornamental plants (other than flowers) were those who most frequently reported having to replace them (65%).

Average costs of replacement of the various categories of plants (per resident reporting damaged plants that need replacement) ranged from $34 for garden vegetables to $620 for shrubbery (Table 1). Replacement cost estimates were $48 per fruit tree and $59 per shrub or woody ornamental plant. Total replacement costs for Islip residents for each category of plant ranged from $340 for garden vegetables to $23,000 for shrubbery. An estimate of total replacement costs

Table 1. ESTIMATES BY ISLIP RESIDENTS OF REPLACEMENT COSTS FOR VARIOUS TYPES OF PLANTS DAMAGED BY DEER.

Types of Plants	Average Cost of Replacement per residence	per plant	Range	Total
garden vegetables	$ 34	--	$0-$150	$ 340 (n = 10)
flowers	$134	--	$0-$600	$ 3,205 (n = 24)
fruit trees	$186	$48	$0-$800	$ 1,300 (n = 7)
shrubs or other ornamental woody plants	$620	$59	$0-$5,000	$22,949 (n = 37)
(nonspecified)	--	--	--	$ 300
				$28,094

for plants due to deer damage incurred by Islip residents was $28,000. In this estimate we made 3 assumptions: (1) all those with damage responded, (2) respondent's estimates of replacement cost were reasonably accurate, and (3) damage not severe enough to require replacement was not reported. Our appraisal of their estimates based on local cost of trees and shrubs used in landscaping is that they were well within the "average" replacement costs typical for the Islip area.

Another cost of deer damage was the cost of control. About 8% of the residents (31% of those with plant damage) used some method of deer damage control; physical barriers (exclosures) and repellents were reported most frequently. Expenditures of up to $4,000 were reported for control, but most people reported much lower costs. In total, Islip residents reportedly spent about $12,000 for deer damage control during the year preceding our survey. Thus, the estimated costs of deer damage incurred plus control measures totalled about $40,000. Consequently, the Islip herd of 30 deer "cost" the community about $1,300/deer in 1984-85.

Although the ranges in dollar estimates of damage overlapped considerably between those reporting tolerable damage and those reporting intolerable damage, the disparity between average dollar estimates (means: $172 vs. $1092; medians: $80 vs. $500) indicated that intolerance of deer damage was associated with considerably higher amounts of damage.

Few respondents who had observed deer feeding, or found evidence of such activity on their property, reported this damage to any officials (16%). Of those who did report their damage, 76% contacted the Seatuck Research Program staff based at the NWR and 29% contacted the New York State Department of Environmental Conservation (NYSDEC). Only 21% had sought damage control information, and

the Seatuck Research Program was reported most frequently as a source of such information (12%), with retailers of materials and supplies for control reported nearly as often as an information source (11%). NYSDEC, U.S. Fish and Wildlife Service, and Cooperative Extension were reported in declining frequency (7%, 3%, and 1%, respectively).

Islip Residents' Attitudes About Deer

Generally, people in Islip considered deer to be an asset to their community (Fig. 2). Only 9% of the PDDI audience regarded deer as a nuisance and believed they could get along without any deer in their neighborhood, compared to 57% who enjoyed having deer in their neighborhood and considered them an aesthetic resource. However, a substantial minority of Islip residents (29%) believed they could enjoy a few deer in their neighborhood but had reservations about the presence of deer because of disease or damage potential they associated with deer. Those who had experienced deer damage recently were less positive about deer; 40% indicated they could enjoy a few deer, but worried about damage and disease, whereas 20% considered deer a nuisance and believed they could do without any deer in their neighborhood.

Islip residents with deer damage generally described the level of damage they sustained as moderate or light; few residents indicated that their deer damage was substantial (13%) or severe (10%). Respondents who experienced deer damage were asked how they felt about damage, regardless of how they described it. They felt generally that the damage they incurred was negligible (33%) or tolerable (33%); 33% indicated the amount of damage they sustained was unreasonable.

An indicator of people's summary opinions, beliefs, and attitudes about deer in their neighborhood is their preference for trends in the deer population. We placed a question about this preference immediately after questions about the respondents' recent deer sightings, perceptions of past trends in deer numbers, amount of deer damage they experienced, and general opinion of deer. We believe a reasonably valid measure of the trend in size of the deer population that was desired locally was achieved. Using this indicator, about 72% of Islip residents (PDDI) surveyed had sufficiently positive attitudes about their neighborhood deer to propose maintaining numbers at or increasing them above current levels (Fig. 3). However, a majority of people who had experienced deer damage recently wanted the deer population reduced.

Damage to plantings was not the only deer-related concern of Islip residents. Respondents expressed concern more often about deer-car collisions and Lyme disease than about damage (Table 2). Furthermore, Lyme disease was rated as the primary deer-related concern of 50% of the PDDI audience, with deer-car collisions reported as a primary concern by another 41%. Among Islip residents who knew that deer used their property, 54% reported Lyme disease as their primary deer-related concern, 37% reported deer-car collisions or other personal injury from deer as their primary concern, and only 9% reported damage to yard plantings and/or vegetable gardens as a primary concern. Thus, from the perspective of a "primary" concern to the most affected audience, damage to plantings was a minor consideration compared with personal well-being of respondents and their families.

Islip residents considered recreational hunting unimportant to them personally (79%), but a majority (66%) believed game animals should be managed for an annual harvest for human use. Many residents believed they should tolerate most wildlife nuisance problems (69%), but tolerance of disease hazard or property damage (44% and 54%, respectively) was less common.

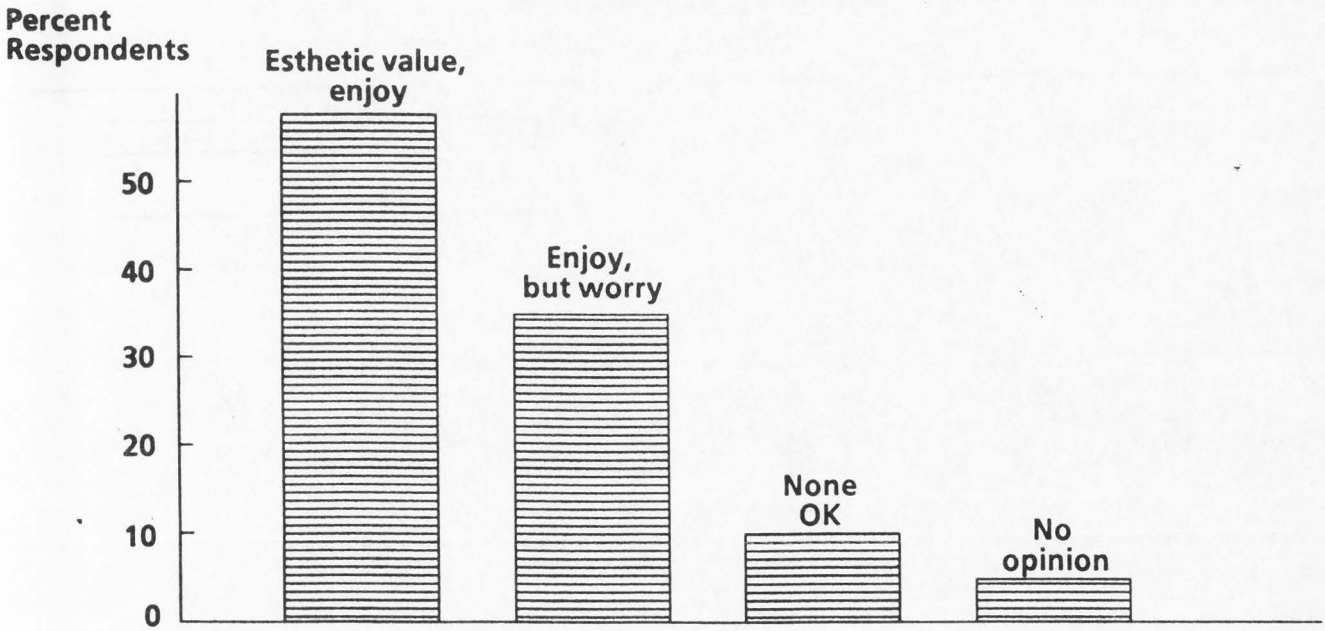

Figure 2. Attitudes of Islip Residents Toward the Presence of Deer in Their Community

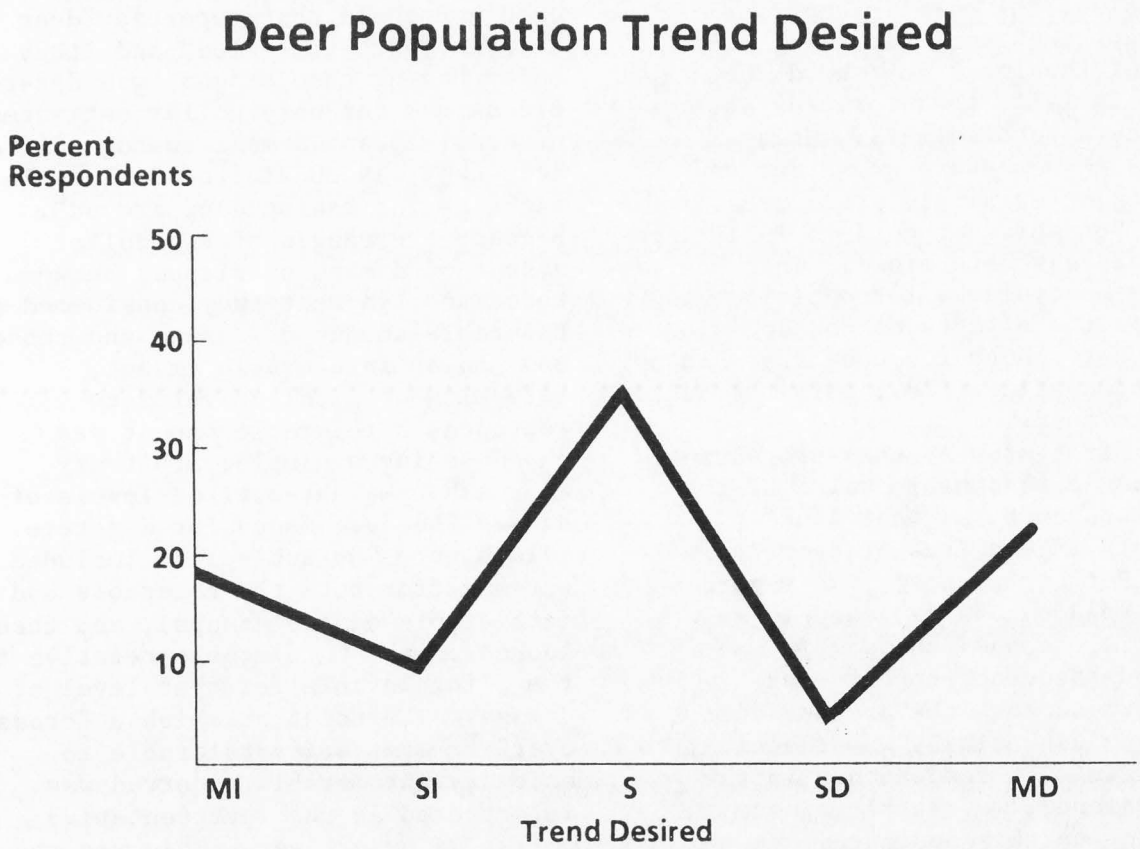

Figure 3. Preference of Islip Residents for Future Deer Population Trends in Their Community (MI=Moderately Increase, SI=Slightly Increase, S=Remain the Same, SD=Slightly Decrease, MD=Moderately Decrease).

TABLE 2. DEER-RELATED CONCERNS OF ISLIP RESIDENTS.

Concerns	PDDI Audience: A Concern (Percent)	PDDI Audience: Primary Concern (Percent)
Deer-car collision (n = 153)	57	41
Lyme disease transmission (n = 144)	53	50
Damage to vegetable garden (n = 31)	12	1
Damage to yard plantings (n = 81)	30	4
Personal injury from deer (n = 27)	10	4
		100%

What Value, These Islip Deer?

An approach to determining the value of the local deer herd to Islip residents is to transform the attitudinal data into dollars. Using dollars as a measure of value, and applying a few simple procedures, a "value" of the deer herd to Islip residents was determined. This has greatest usefulness for decision-making: the effects of one decision relative to another can be assessed by impacts on value (i.e., dollars) added or diminished.

The first step in this procedure is selecting a reasonable value of the deer resource to an individual household in the area of deer influence. For our purposes, we regarded each respondent as representing a household, because the sample was selected based on property-tax records. Because the area of deer influence essentially was identical to the holdings of respondents in the PDDI audience, we restricted our attention to this audience.

The value of deer to be assigned for each household that reported "deer have an aesthetic value" and "they enjoy having them around" was determined from our only dollar estimates of deer: plant damage sustained from deer that was considered "tolerable in exchange for having deer around". Because the ranges of the dollar amount of damage overlapped between those who had what they considered a tolerable amount of damage and those who had an intolerable amount, selection of a dollar value to represent a tolerable amount was chosen using a simple, arbitrary approach. We categorized levels of damage (because cases for discrete values were low and seldom included persons from both the tolerable and intolerable damage groups), and then looked at the % tolerable relative to the % intolerable for that level of damage. The point at which a "cross--over" from majority tolerable to majority intolerable occurred was interpreted as the representative dollar value of deer. This was the

$500 to $999 category. To be conservative, we chose $500 rather than the category mid-point of $750. A value of $500 was also found to be the median value for damages reported by the intolerant residents (Fig. 4). Thus, we used $500 as a base for the remainder of this calculation.

To determine the total value of ths Islip deer herd, we multiplied $500 times the n for the PDDI audience, minus some exclusions. First, to be conservative and to account for the concern for Lyme disease, only those who unconditionally stated that deer had aesthetic value were included (n = 165). Because we did not receive responses from every person in the study area, some of whom probably saw deer, we took another conservative step by considering them disinterested in deer (i.e., by not adding a proportion of them to our determination of n). Thus,

$500 x 165 = $82,500.

The costs of the deer herd can be thought of as the total damage incurred by those who considered their damage intolerable ($22,920) minus the tolerable portion of that damage. For this calculation we took the number of people reporting intolerable damage (21) and multiplied by $500, the average value of deer, for a total of $10,500, then subtracted this from the total amount of damage reported by the intolerant group.

$22,920 - $10,500 = $12,420.

This amount was then subtracted from the gross value to arrive at a net value:

$82,500 - $12,420 = $70,080.

Thus, the Islip deer herd had an annual net value of over $70,000 to those who had some experience with the deer. Remember, this estimate excluded those respondents with concern for deer damage or disease transmission (i.e., these people were essentially assigned a deer value of $0). This estimate can be adjusted further by deducting the cost of damage control ($12,000), for an adjusted net value of $58,000.

What are some applications of these values and their implications for management decision making? Assume the deer herd was eliminated purposely from Islip. The real cost of this management action would be the cost of the operation required to effect the elimination plus $58,000. (Of course, the other survey data indicated there may be some other community relations costs associated with such action, as well.)

On the other hand, if the disease hazard could be overcome, the value of the deer herd could increase by $41,500, or 72%, to $99,500 (83 people reported concern for Lyme disease and did not respond unconditionally that deer were aesthetically valuable).

Similarly, if people also could be made to realize (e.g., via an educational communication program) that deer posed little or no threat to personal safety, and that through driving carefully the deer-car collision hazard could be reduced to insignificance, the value of the deer herd could increase by $11,000 (22 people reported concern for personal injury/deer-car collision and did not respond unconditionally that deer were aesthetically valuable). Thus, the deer herd could nearly double in value ($58,000 to $110,500) if concerns about disease and car collisions were overcome.

Another use of these value estimates would be in establishing the level of resources to allocate to a deer damage control program. For example, 21 people who reported damage indicated that deer were a nuisance or that they worried about deer damage. These people had a total of $22,920 estimated damage. Given this information, how much is a reasonable amount to spend for a deer damage control program? If you consider that the average value of deer is $500, then

$500 x 21 = $10,500 and

$22,920 - $10,500 = $12,420,

thus indicating that an expenditure for deer damage control that results

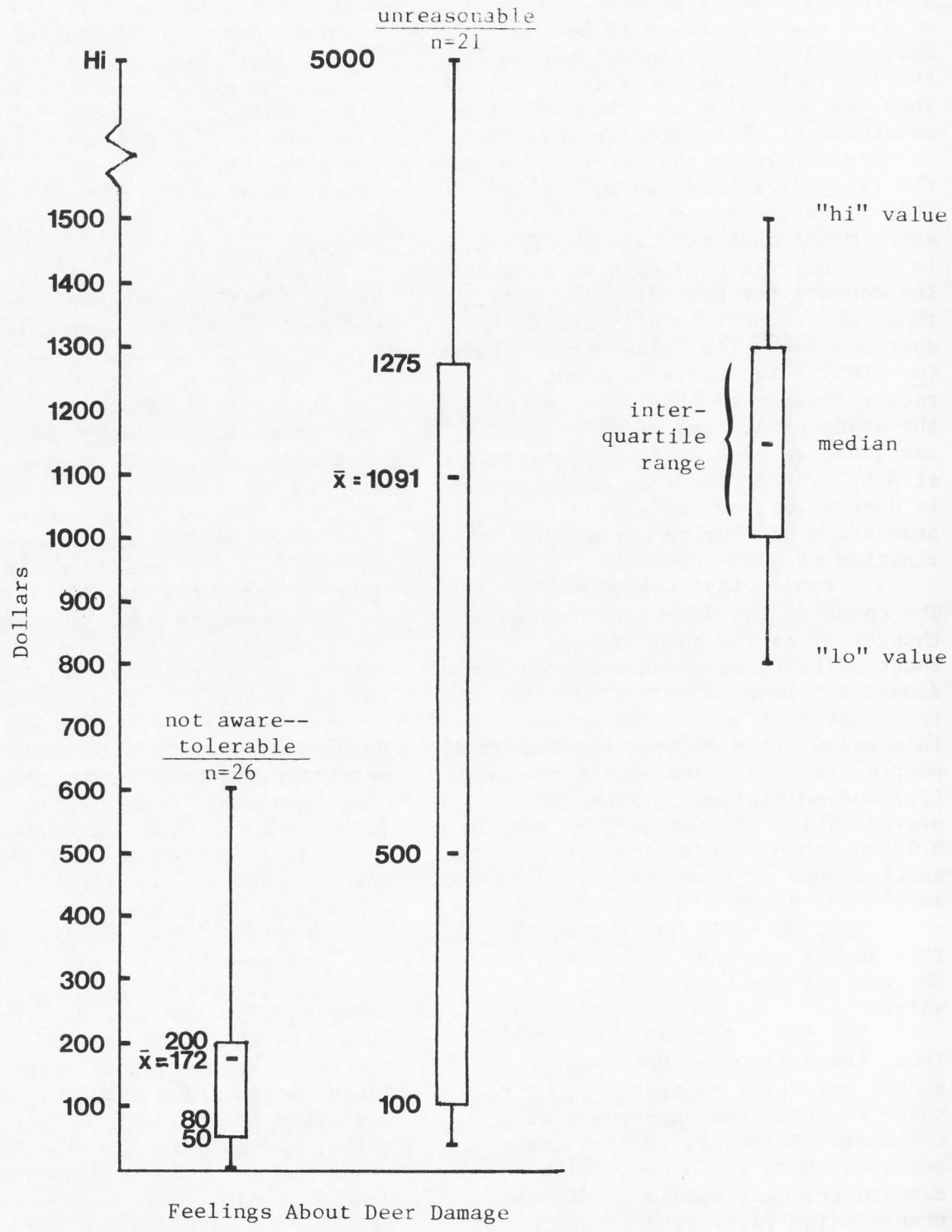

Figure 4. Damage Estimates, by Tolerance (PDDI Audience).

in a reduction of $12,420 of damage annually would be warranted. At most, this should be $12,420, the theoretical equivalent of direct payments to property owners to cover the intolerable portion (theoretically) of the damage incurred.

Obviously, the assumptions made and the procedure used to arrive at the value estimates should be reviewed critically. Nevertheless, the approach has intuitive appeal and utility for decision making. We offer this for consideration primarily to raise awareness of a broad concept of costs and benefits associated with herd management in a suburban area.

IMPLICATIONS

This section includes our view of the implications of these data for management of the deer herd to reduce damage, and implications for extension programming. This dichotomy is used for convenience only; we believe that a comprehensive approach to management of deer damage should integrate both areas. The importance of extension education relative to herd control in achieving effective management of deer damage will vary among situations.

Implications for Deer Management

The most apparent management question might be "Is there need to control herd size now?" This is posed strictly from the perspective of damage control; interactions between deer and their habitat are not included in this discussion. "Damage" is interpreted broadly to include all the primary concerns of Islip residents identified in the study. Because deer-car collisions are extremely infrequent, and the role of deer in the transmission of Lyme disease is not understood fully, deer depredations on ornamental plantings might be the major consideration. However, our data indicate that overall the deer have a positive net value, given the current herd size. But more deer may not necessarily mean more value -- a threshold level could be expected.

Consequently, the relevant question might be "What do we need to consider now in anticipation that herd control might have to be implemented in the future (e.g., if damage escalates, or if Lyme disease becomes a greater threat and deer are shown to be implicated in transmission of the disease to humans)?" This proactive approach to management planning might first identify impediments to herd control. On the biological side, there may be nothing unique to consider. On the sociological side, however, we can quickly see the potential for problems. Recreational hunting is not acceptable to most Islip residents. Fortunately, this does not indicate opposition to the concept of management, for they largely recognized and viewed positively the concept of managing wildlife as a renewable resource. Unfortunately, alternative methods for herd control are seldom feasible, so our experience with them is limited.

Nevertheless, control of a herd the size of that in Islip may require removal of as few as 5 mature females per year. With so few deer needing to be cropped to maintain a stable population, methods we do not normally espouse may become feasible. Trapping, drugging, and even sterilization may not be out of the question. Sacrificing animals may be even more acceptable if this was to be done for biological research as well as herd control. Such options should be weighed for both feasibility and acceptability prior to the time when they might need to be employed. This approach could give a manager the time to lay the groundwork for public acceptance of herd management and possibly avoid open conflict.

Implications for Extension Education

Islip residents generally enjoyed their local deer herd, were relatively tolerant of damage they incurred and were willing to invest in damage control. Because most damage occurred

on ornamental plants, control measures that detract from the aesthetic character of residential property probably will not be satisfactory. Thus, exclosures of various types, the most effective protection available, will find limited acceptance. Though less effective for damage prevention, repellents may have a place in this suburban situation; their effectiveness is usually limited by neglect in achieving full foliage coverage and inadequate attention to reapplication (e.g., after heavy rains or a specified period of time). Although neglect has been a concern in other situations, it may be less so in suburban areas where residential landscape may be sufficiently important to warrant regular maintenance by the property owner. Given the generally positive attitudes toward the presence of deer that we identified among the PDDI audience, and the relatively high value these people placed on their neighborhood deer, the cost of damage prevention might be insignificant to these property owners.

Probably the greater extension education challenge is that related to Lyme disease. This disease has the potential to become a highly emotional and highly politicized issue, which could result in ill-considered, actions imposed by politicians in response to citizen pressure. It could also serve to polarize the community if one group of residents wants the deer herd iradicated to eliminate the Lyme disease hazard altogether, and another group values the deer herd above the threat of disease. The critical point in all this is that the ecology of Lyme disease transmission (tick-deer-other mammal interactions) is only beginning to be understood. An extension education program with the objective of keeping the general public, citizen leaders, public officials and, particularly, elected representatives informed of the status of existing knowledge should be given high priority.

Reducing damage to tolerable levels (such as through damage prevention), and reducing concerns about Lyme disease could have a substantial effect on preferences for deer population trends. If more widespread tolerance of the Islip deer herd at or near its current level was a management goal, extension education directed at alleviating damage and unwarranted disease concerns could be vital to accomplishing that goal. Furthermore, extension education could be used to inform residents of the limited number of techniques available to managers for herd control in an area such as Seatuck NWR. An atmosphere of public understanding and acceptance (if not support) might be developed prior to taking any specific herd control actions. It might even be possible to determine which control alternative is most acceptable, greatly facilitating the managers' choice of control method.

As suburban deer populations continue to grow, situations like that in Islip will become more common. We need to understand our constituencies in these nontraditional management settings if we hope to serve their interests well. We are optimistic that novel, rational approaches can be developed for structuring acceptable and effective solutions to the management of suburban deer populations.

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